DOCUMENT RESUME

ED 470 195 IR 021 637

AUTHOR	Lee, Doris; Chamers, Terri
TITLE	Web-Based Training and Corporate America.
PUB DATE	2001-11-00
NOTE	9p.; In: Annual Proceedings of Selected Research and Development [and] Practice Papers Presented at the National Convention of the Association for Educational Communications and Technology (24th, Atlanta, GA, November 8-12, 2001). Volumes 1-2; see IR 021 504.
PUB TYPE	Reports - Evaluative (142) -- Speeches/Meeting Papers (150)
EDRS PRICE	EDRS Price MF01/PC01 Plus Postage.
DESCRIPTORS	*Computer Mediated Communication; Computer Oriented Programs; *Corporations; Cost Effectiveness; *Distance Education; Instructional Design; *Professional Development; *Training; *Web Based Instruction; World Wide Web

ABSTRACT

Recent issues of training, computer, and management magazines all suggest that Web-based training (WBT) is the best way to reach geographically dispersed employees quickly and at low costs. The purpose of this paper is to explore the many unique characteristics of WBT and to discuss important issues related to the use of WBT in a corporate setting. These issues include the cost effectiveness considerations of using WBT, the design, implementation and delivery of WBT, and the impact that WBT has on both learners and trainers. Examples of how WBT is being used in American corporations are also introduced. (Contains 61 references.) (AEF)

Reproductions supplied by EDRS are the best that can be made
from the original document.

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

P. Harris

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

1

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Web-Based Training and Corporate America

Doris Lee
Terri Chamers
Penn State Great Valley School of Graduate Professional Studies

ED 470 195

Introduction

Advances in technology offer the possibility of new methods for delivering instruction. Learning via the Internet is being heralded by many as the new pedagogical model for training. Recent issues of training, computer, and management magazines all suggest that web-based training (WBT) is the best way to reach geographically dispersed employees quickly and at low costs. Some articles offer examples of companies that have successfully implemented WBT. However, the same articles that tout WBT as the next wave in the instructional technology revolution often fail to provide the reader with specific, instructionally sound steps for implementing WBT in a corporate setting.

Furthermore, many companies eager to embrace WBT have focused their attention on the features of the new technology. The trainers and/or instructional designers who fall into this trap expect WBT's features alone to provide effective instruction (Alexander, 1995). As a result, the advantages that WBT offers are often overshadowed by poor design and cumbersome navigation (Cohen & Rustad; 1998; Filipczak, 1997b; Henke, 1997; Strandberg, 1999). Learners are set adrift in cyberspace with little or no instruction.

The purpose of this paper is to explore the many unique characteristics of WBT and to discuss important issues related to the use of WBT in a corporate setting. These issues include the cost effectiveness considerations of using WBT, the design, implementation and delivery of WBT, and the impact that WBT has on both learners and trainers. Examples of how WBT is being used in American corporations will be introduced, too.

WBT

WBT refers to the communication of information over the World Wide Web (WWW) with the intent of providing instruction (Kurtus, 1997). WBT makes it possible for students, the instructor, the course content and, at times, professional groups and subject matter experts, to be in different locations at possibly different times and yet still be brought together through the use of on-line technology (Dede, 1996; Heckman & Owens, 1996; McIntrye, 1996; Saltzberg & Polyson, 1996; Smith, Tyler & Benscoter, 1999; Stenerson, 1998; Williams, 1998). WBT allows learners who cannot have face-to-face training to attend classes in their homes or offices through the use of the Internet or a company's intranet (Henke, 1997; Levin, Levin & Waddoups, 1999).

WBT uses Web technologies, such as, Web browsers including Microsoft Internet Explorer or Netscape Navigator, Hypertext Transfer Protocol (HTTP), Transmission Control Protocol/Internet Protocol (TCP/IP) protocols, and Hypertext Markup Language (HTML) as its programming language. HTML is a language that allows computers linked to the Internet to transfer information to one another, thus enabling the computer to retrieve all or just parts of the information located on a Web site (Hall, 1997; Polyson, Saltzberg & Godwin-Jones, 1996; Rutherford, 1996). By using HTML, the learner can explore additional resources in other web sites in the order and at the pace that he or she prefers. This experience, for most WBT learners, is similar to staying after class to talk with other students or the instructor.

WBT can be synchronous or asynchronous. Synchronous training is instantaneous and allows the instructor and learners to interact via the Web in "real-time" (Driscoll, 1998; Kruse & Keil, 2000). This can be accomplished through on-line discussions, real-time audio, videoconferencing, and application sharing where two or more people can work on the same file, such as a shared electronic whiteboard or a spreadsheet, simultaneously. In contrast, asynchronous training is not instantaneous; the learner logs on to the course to complete the lesson or post, receives and responds to messages at his or her own pace and at the time that is convenient to him or her(Bearman, 1997; Driscoll, 1998; Kruse & Keil, 2000). In using either type of WBT, it offers learners a higher degree of anonymity, as compared to face-to-face instruction. The anonymity enables the learner to interact with other learners in an environment free from bias or discriminations due to age, gender, economic status, or appearance differences.

In theory, any type of content can be presented via WBT (Beer, 2000; Driscoll, 1998). For example, WBT can be a good venue for presenting verbal information. WBT is also appropriate for delivering instruction related to concept and rule learning and problem solving skills. However, motor techniques and attitudinal skills are not well

IR021637

BEST COPY AVAILABLE

suited to WBT. This is due to the limitations of WBT in allowing the learner to practice the sequence involved in mastering the motor skills as well as procedures required for attitude or behavioral changes.

The Status of WBT in Corporate America

Many corporations now use some form of WBT to deliver training. According to a Fortune magazine survey, corporations in year 2000 spent approximately 20% of the $66 billion allocated for training annually on WBT (Gotschall, 2000). That percentage is expected to increase to 40% by the year 2003. In addition, a report provided by Masie in 1997 stated that in 1997 alone, 71 percent of major U.S. companies had an objective of using their intranets to pilot the delivery of corporate training presentations. Masie also reported that major software publishers, including IBM and Microsoft, are working on online learning and training products and services. Companies who published multimedia authoring tool companies like Macromedia and Allen Communications, are also building Web delivery capability into its products. Finally, Masie detailed that the majority of classroom-based training companies, such as CBT Systems and Gartner Group, has begun to establish online learning products (Anonymous, 1997).

Other corporate examples in using WBT include, PricewaterhouseCoopers, a consulting firm, is introducing a new learning technology called Continua. This technology allows employees to form virtual professional communities based on areas of interest, abilities, or client relations. Services such as peer dialogue, chat groups, online events, and online training are part of Continua (Koonce, 1998). In addition, in a recent study by Hall, it is reported that the Cisco Systems had the most pervasive e-learning implementation (Hall & LeCavalier, 2000). Cisco Systems offers some form of WBT in all 30 of its training organizations, with its major emphasis on sales training. However, Cisco itself notes that it uses WBT to deliver only 5% of its total training ("Learning on Demand").

Siemens Business Communications launched Siemens Virtual University (SVU) in 1997 and now offers more than 64 courses, from Local Area Networks and Wide Area Networks (LAN/WAN) technology to customer relations, to its 7,500 employees worldwide (Frieswick, 1999). Dell Computer Corporation aggressively pursued Web-based training as a solution to its employee education needs (Cone, 2000; Galagan, 2000). The company patterned its training after its business model, which emphasizes a direct-to-customer approach, with on-line training available 24 hours a day, 7 days a week. Dell's Vice President of Learning, John Cone, expects 90% of its courses to be delivered online by 2001. In 1998, Dow Chemical, headquartered in Midland, MI, began the process of converting its 700,000 employee-hours of industry-related training into Web-based training modules (Barron, 1999a). It anticipates that by the end of 2001, it will offer more than 60 courses via WBT, representing three-quarters of its industry-related training and an additional 300,000 hours of employee-development training.

In addition, IBM, Xerox, Siemens Business Communications and Eli Lilly Corporation employ a combination of individual assignments coupled with group discussions and projects in their WBT courses (Frieswick, 1999; Hibbard, 1998; "IBM builds its manager training," 2000; "Siemens saves $2000," 2000). Most of these courses are asynchronous. Only Chrysler, Herman Miller, Siemens Business Communications and Aetna offer real time learning to their employees (Barron, 1999a; "Herman Miller turns," 2000; Hibbard, 1998).

The topics most commonly taught via WBT are company-specific procedures and products. Southern California Edison, Siemens Business Communications, Xerox, Herman Miller, Dow Chemical, General Motors, Ford Motors, Cisco Systems, Eli Lilly, and Dell all use WBT to train employees on company-specific processes and products (Barrett & Lewis, 2000; Barron, 1999a; Beer, 2000; Frieswick, 1999; "Herman Miller turns," 2000; Hibbard, 1998; "Southern California Edison uses," 2000; "Smarter sales force," 2000). Technology-based courses, such as software programs or how to navigate the Internet, appear to be second to product and processes in course offerings. Dell, Microsoft, KPMG, Charles Schwab and Siemens Business Communications all offer technology-based courses to their employees (Balu, 2000; Dobbs, 2000b; Frieswick, 1999; Gotschall, 2000; Hall, 1997). Dell and Xerox also offer an orientation program to new employees via WBT (Beer, 2000; Cone, 2000) and Dell and IBM offer management courses via WBT (IBM builds its manager training, 2000).

Important Considerations of Using WBT in Corporations

A company must consider many factors when deciding whether or not the move to WBT would be cost effective. These factors are explained as follows.

Considerations of Cost Effectiveness

The first consideration is the cost that a company will spend on equipments, for delivering WBT courses. Normally, a Web server dedicated to supporting the materials can range from less than $5,000 to more than $100,000 (Beer, 2000; Hall, 1997) and in some cases, may also require an access license fee for each user (Wells, 1999). Companies may also need to pay for special "plug-in" software for special features, such as video, animation, and sound.

Companies also need to consider if they could afford allocating internal resources to create WBT courses. Normally, it would take between 100 – 200 hours to develop one hour of on-line instruction (Beer, 2000; Frieswick, 1999). For some companies, it may be more practical to contract with an outside vendor to develop the WBT courses. Most WBT design vendors charge anywhere from $7,000 to $50,000 per finished hour, depending on the course's complexity and use of multimedia plug-ins (Hall, 1997; Kruse & Keil, 2000). Consequently, whether the WBT is developed internally or externally, companies can spend thousands of dollars on the development stage. In addition to the development of WBT, maintaining the course is another issue. Maintenance costs often include revisions to the course and subsequent Web site maintenance (Beer, 2000; Hall, 1997; Kilby, 1997; Sanders, 1998). Web server maintenance and course upgrades can cost upwards of $500,000 per year.

Furthermore, how a WBT course will be used also affects a company's overall investment considerations. For example, a course that will be delivered once or twice, then abandoned, is not a good candidate for WBT (Kruse & Keil, 2000). Companies must consider the total number of learners who will be using the course and consider if the course can help reducing the amount of time the learners will be pulled out from their regular jobs.

However, while initial costs for WBT can run anywhere from $75,000 to $1.6 million (Barron, 1999a; Frieswick, 1999), Hall (1997) asserts that WBT "reduces the cost of training when compared to instructor-led training...primarily from a reduction in training time and the elimination of travel" (p. 108). Wells (1999) also emphasized that the initial costs to implement WBT are often offset by the long-term gain in employee productivity. By using WBT, companies can train a larger number of employees in a shorter time frame and at reduced costs when the materials are delivered via WBT (Barron, 1999a; Beer, 2000; Driscoll, 1998; Hall, 1997; Salopek, 1998; Wells, 1999).

For example, Hewlett Packard reports that WBT has reduced its new sales representative training from 20 weeks to eight days per year (Reinhardt, 1995). Hewlett Packard estimates saving $800,000 per year since its use of WBT. Before using the Web, Hewlett Packard must budget travel expenses both for its trainees and trainers, and must spend money on renting many convention centers in different cities for its sales training. Additional examples include, Aetna U.S. Healthcare estimates that it saved $3 million in travel and associated costs the first 18 months of its on-line training programs (Barron, 1999a). Steelcase, the largest office furniture manufacturer in the United States, has cut its training costs by 30% through the use of Web-based training ("Steelcase to save resources," 2000). Siemens Business Communications estimates that WBT has saved the company $4 million in travel costs alone (Frieswick, 1999) while IBM estimates that for every 1000 employees who use WBT, the company saves $500,000 in travel-associated costs (Kiser, 1999). MCI estimates that it realized a savings of $2.8 million in reduced travel, facility and labor costs in a 20-month period after the introduction of WBT (Neilson, Pasternack & Viscio, 2000). Rockwell Collins, a company that manufactures cockpit instruments, estimates that its newly-implemented WBT delivery system will save the company $14 million in three years in travel costs alone (Fister, 2000). Price Waterhouse realized an 86% cost savings using WBT over traditional classroom delivery (Hall, 1997). Dow Chemical estimates its $1.6 million WBT start-up costs are yielding a return of $4-$5 million annually (Barron, 1999a). And, Budget Rent-A-Car reduced its per employee cost from $2000 to $150 by placing its new employee training on the Web (Schaaf, 1997).

Considerations for Course Consistency and Delivery

Other factors that a company needs to consider when using WBT include, if the course content need to stay consistent over time, and if the course need to be delivered to the learners instantly. If the answers to these questions are "yes', WBT would be a good choice. WBT offers a higher level of content consistency that is difficult to be attained by human trainers. It can also prevent from a course being changed in re mote offices. In other words, companies can use WBT to provide standardized training for all trainees regardless of different locations or instructors (Reinhardt, 1995). WBT can also provide instant distribution of the course content. The content of most WBT can be updated instantly, which is not possible with any other educational technologies. Technologies such as CD-ROMs, printed materials, floppy disks, videos, etc. must be mechanically reproduced, then mailed to the learners. With WBT materials, the designer simply has to send the course material or updates to the server and it will be available to the learner instantly (Driscoll, 1998; Hibbard, 1998; Kruse & Keil, 2000; Sanders, 1999; Staley, 1999).

Considerations of the Bandwidth Limitation

One of the frustrations related to the use of WBT in many corporations is the bandwidth limitation. Bandwidth determines how much information can be sent across the web and how fast it will be sent (Filipczak, 1997a; Hall, 1997; Schaaf, 1999a; Williams, 1998). Bandwidth problems translate to slow transmission and delayed response time for learners. Learners may become frustrated and bored when response time is very slow (Kiser, 1999; Kurtus, 1997).

Bandwidth can become an issue in one of three places: the originating computer, the "pipeline" over which the information is sent (in most cases, a telephone line), or the receiving computer. The most common bandwidth problems focus on the "pipeline." The "pipeline" refers to the data-carrying capacity of the computer-to-computer delivery channel. Common pipeline sizes range from relatively small 28.8 kilobytes per second (kbps) modems to optical fiber that can handle more than 10 gigabytes (gbps) per second. The problem of pipeline capacity arises when designers add data-intensive multimedia such as videos, complex audio, live transmissions, and animation to WBT programs (Bassi et al., 1998; Filipczak, 1997a; Kurtus, 1997; Schaaf, 1999a; Schaaf, 1997; Williams, 1998). The increasing use of the Internet also adds to bandwidth problems (Bassi et al., 1998; Schaaf, 1997). In 1996, bandwidth demand was approximately 200 trillion bits per day (bpd). This figure is expected to rise to 9,000 trillion bpd as early as 2001 and to 220,000 trillion by 2006, creating the potential for a network overload.

However, bandwidth problems can be lessened by creating separate, smaller programs that are executed within the primary application ("Applets," 2000: Beer, 2000). These smaller programs, called applets, are designed to be downloaded from the Web and launched by the primary application to support simulations and other media-intensive applications without adding to the size of the primary program. For example, the designer or programmer could create a master file that contains the rules and programming language necessary to run all simulations. The master file is then stored separately from smaller files that contain information specific to individual simulations. When a simulation is started, both files are used, but because they are stored separately, the download time is faster than when all the information is stored in one large file. Recently introduced Digital Subscriber Lines (DSL), satellite transmission systems and cable modems are becoming the alternatives to slow dial-up modems and bandwidth limitations (Bassi et al., 1998; Wiley, South, Basset, Nelson, Seawright, Peterson & Monson, 1999). These technologies offer users the ability to connect to the Web via standard telephone lines and receive data at rates considerably higher than 33.6 kbs. However, because DSL and cable modems use shared data pathways, increased use of these technologies eventually will result in reduced transmission speeds.

Considerations of Learners' Technical Skills

One of the more challenging obstacles when implementing WBT is the learner's lack of computer and/or Internet skills (Wulf, 1996, p. 54). For many organizations, this could mean additional technical training. In addition, employees with limited technical background and skills may feel apprehensive and confused. They may resist WBT training. Another possible drawback of using WBT is that the organization must rely on the individual to take initiative with his or her own WBT training (Wulf, 1996, p. 54). With WBT, although the company does not need to require an employee to be at a certain place at a particular time, however, the company must communicate with employees regarding when and where they will be trained and the level of participation.

Other Considerations

In addition to the above considerations, other considerations include security, the changing role of the trainer and the training department, and the impact of digital relationships. Security has become a growing concern. Since the Internet was originally designed as a private network for the military and for educational use, at that time, security was not a problem. With the growth of businesses on the net, the need for security has become greater with a public network (Keen, Mougayar, & Torregrossa, 1998).

There is also a concern regarding the skills and resources needed by the traditional trainer and training department if the organizations focus shifts to training via the Web. This is especially true since close to 50 percent of training departments are composed of classroom trainers (Appleton, 1998, p. 1). For example, the online instructor does not have the same type of control over a group of learners as they would in a typical classroom environment. The instructor must become more of a facilitator or moderator (Kearsley, 1997). Additionally, an online trainer in an environment that does not incorporate video is limited by not being able to see the learners. By seeing the learners, an instructor can gauge attention levels and comprehension of material. The trainer must ensure that the learners interact. They can do this by monitoring chat rooms, virtual white boards, etceteras (Snell, 1998).

The focus of training departments may become more centered on using Internet tools to develop, deliver, and monitor online training digitally, as opposed to developing and delivering classroom training.

Finally, there is concern regarding the impact of the prolonged exposure of learners and instructors to digital environments (Stone, 1996), as well as the formation of digital relationships versus the traditional development of relationships (Murphy, 1996). Some also feel that with the loss of face-to-face interaction, behavioral, gestures, and tonal cues may cause misunderstanding (Pennell, 1996).

Organizational Implications in Using WBT

The first implication is related to the function and skills of trainers or instructional designers of a company. While developing WBT courses, corporate trainers or instructional designers need to be proficient in skills that are not normally associated with classroom or face-to face instruction design (Alexander, 1995; Beer, 2000; Curtin, 1997; Dobbs, 2000b; Hall & LeCavalier, 2000; Horton, 2000). They now need to possess a thorough understanding of HTML, computers, networking, and Internet protocols in order to incorporate materials that are Web-compatible. Clearly, the Web is a largely visual medium; it would be helpful for corporate trainers to be proficient in graphic design and layout. It would be also helpful for the trainers or designers to have an artistic perspective and a basic understanding of ratio aspects.

The second implication concerns the relationship between the Training department and the Information Technology (IT) department. Clearly, as a company moves to WBT, the Training Department needs technical support from the IT department (Curtin, 1997; Driscoll, 1998; Filipczak, 1997a; Hall & LeCavalier, 2000; Kiser, 1999). The two departments now must work together to ensure that WBT does not create a drain on the company's network, servers and IT Help Desk.

One result of this collaboration will be that trainers and/or the instructional designers instructional designers will have a better understanding of the technology used for WBT, and the IT professionals will benefit from an increased understanding of instructional design process.

Finally, the last implication is about merging working and learning among employees. As WBT becomes more commonplace in organizations, companies will find more ways to integrate it into employees' everyday work lives (Beer, 2000; Cone, 2000; Driscoll, 1998; Ryan, Neece & Meyer, 2000). Employees will have WBT available as a means of quick reference at their desktops. They will be able to access a WBT course, or a small piece of it, to seek the information they need. Employees will come to expect instantaneous information and to access to subject matter experts as a way of doing business. Employees will eventually become so used to the process of receiving information "just-in-time" without even realizing that they are learning while working.

Reload buttons should be available to make the learner's navigation through the course easier (Kruse & Keil, 2000). In addition, page transitions should be simple and speedy to avoid long download times and subsequent learner frustration (Curtin, 1997; Williams, 1998). Every page should include a link to the course's home page to allow a "lost" learner to find his or her way back to the course easily (Nielsen, 1996). Multimedia should be avoided because of download time constraints, unless it is critical to the learning process (Beer, 2000; Clark & Lyons, 1999).

Finally, storyboards for each WBT module are strongly recommended for designing and revising purposes (Driscoll, 1998; Hall, 1997; Kruse & Keil, 2000; Ward, 1998). Storyboards are visual representation of the information that will be included on the screen. One storyboard should be created for each screen, and it should include thumbnail sketches of all onscreen visuals and the corresponding text. Storyboards should include identifying information, such as the course title, the date, the version or draft number, and the page number. It will also specify the names of the files (audio, video, graphic) to be used, file numb ering schemes, programming notes, and branching instructions.

Conclusion

WBT is time and location independent and thus enabling companies to train their widely dispersed employees without incurring exorbitant travel cost. Employees are also allowed to have a higher level of flexibility while taking a WBT course. However, technical and design issues present obstacles to the effective use of WBT in many corporations. It is imperative that WBT is grounded in learning theories and instructional design principles. Effective WBT must also engage employees and provides them with opportunities to apply the gained knowledge and skills back to their jobs.

References

Alexander, S. (1995). Teaching and learning on the World Wide Web. Retrieved November 14, 1999 from the World Wide Web:http://elmo.scu.au/sponsored/ausWeb/aus Web95/papers/education2/alexander/

Applets. (2000, February 19). Retrieved August 7, 2000 from the World Wide Web: http://webopedia.internet.com/TERM/a/applet.html

Balu, R. (2000). KPMG faces the internet. Fast Company, 32(50). Retrieved April 27, 2000 from the World Wide Web: http://www.fastcompany.com/online/32/kpmg.html

Barrett, C. & Lewis, D. (2000). Reusable learning object strategy. Retrieved October 28, 2000 from the World Wide Web: http://www.cisco.com/warp/public/10/ wwtraining/elearning/learn/whitepaper_docs/rlo_strategy_v3-1.pdf

Barron,T. (1999). Harnessing online learning. Training and Development, 53(9), 28–33.

E-Bassi, L., Cheney, S. & Lewis, E. (1998). Trends in workplace learning: supply and demand in interesting times. Training and Development, 52(11), 62–66.

Beer, V. (2000). The web-learning field handbook: using the world wide web to build workplace learning environments. San Francisco: Jossey-Bass Pfeiffer.

Bearman, Margaret. (1997). Why use technology? Retrieved November 20, 1998 from the World Wide Web: http://www.monash.edu.au/informatics/teachme/whyuse.htm

Cohen, S. & Rustad, J. (1998). High tech, high touch, high time? Training and Development, 52(12), 31–37.

Cone, J. (2000). How Dell does it. Training and Development, 54(6), 58–70.

Curtin, C. (1997). Getting off to a good start on intranets. Training and Development, 51(12), 41–46.

Dede, Chris (1995). The transformance of distance education to distributed education. Retrieved November 14, 1999 from the World Wide Web: http://www.hbg.psu.edu/bsed/intro/docs/distlearn/index.html

Dobbs, K. (2000). Who's in charge of e-learning? Training, 37(6), 55–58.

Driscoll, M. (1998). Web-based training: using technology to design adult learning experiences. San Francisco: Jossey-Bass Pfieffer.

Filipczak, B. (1997a). Are you wired enough? Training, 34(12), 25–39.

Filipczak, B. (1997b). Training gets doomed. Training, 34(12), 25–31.

Fister, S. (2000). Reinventing training at Rockwell Collins. Training, 37(4), 64–70.

Frieswick, K. (1999). The online option. CFO, 15(12), 89–92.

Galagan, P. (2000). Getting started with e-learning. Training and Development, 54(5), 62–64.

Gotschall, M. (2000). E-learning strategies. Retrieved October 28, 2000 from the World Wide Web: http://www.fortune.com/fortune/sections/onlinelearn/onlinelearn.htm

Hall, B. (1997). Web-based training Cookbook. New York: John Wiley & Sons, Inc.

Hall, B. & LeCavalier, J. (2000). The benchmarking study of best practices. e-learning, 1(4), 27–41.

Heckman, B. & Owens, D. (1996, January). Pedagogical contributions of education environments: the traditional classroom, computer-based learning and the world wide web. Paper presented at the meeting of the American Meteorological Association, Boulder, CO.

Henke, H. (1997). Evaluating web-based instructional design. Retrieved November 14, 1999 from the World Wide Web: http://scis.nova.edu/~henkeh/story1.htm

Herman Miller turns to Learning Space 4.0 to train its dealers. (2000, May 15).

Lotus Development Corporation. Retrieved May 25, 2000 from the World Wide Web: http://www.lotus.com/news/news.nsf/public/A1C2BEB10E2CD738852568E00042CDE8

Hibbard, J. (1998, March 9). The learning revolution. Information Week, (672), 44–60.

Horton,W. Instructional design for online learning. Getting started with online learning. Retrieved from the World Wide Web on October 28, 2000: http://www.macromedia.com/learning

IBM builds its manager training program with Learning Space 4.0 Lotus Development Corporation. Retrieved June 27, 2000 from the World Wide Web: http://www9.software.ibm.com/mindspan/distlearning.nsf/wdocs/5EE5DODC064CAD03852568DA00655551?Open Document

Kilby, T. (1997). What is web-based training? Retrieved November 1, 1999 Web-based training Information Center database: http://www.filename.com/wbt/pages/htm

Kiser, K. (1999). 10 things we know so far about online training. Training, 36(11), 66–74.

Koonce, R. (1998). Where technology and training meet. Technical Training, 9(6), 10–15.

Kruse, K. & Keil, J. (2000). Technology based training. San Francisco: Jossey -Bass Pfeiffer.

Kurtus, R. (1997). Authoring web-based training. Retrieved November 1, 1999 from the World Wide Web: http://www.ronkurtus.com/wbt/wbtauthoring.htm

Learning on demand: a strategic perspective. Retrieved October 28, 2000 from the World Wide Web: http://www.cisco.com/warp/public/10/wwtraining/elearning/pdf/lod_rpt1_cisco.pdf

Levin, J., Levin, R. & Waddoups, G. (1999). Multiplicity in learning and teaching: a framework for developing innovative online education. Journal of Research on Computing in Education, 32(2), 256–270.

McIntyre, M. (1997). The web as an effective tool for adult learners. Retrieved November 14, 1999 from the World Wide Web: http://www.tcm.com/trdev/mcintrye.htm

Nielsen, J. (1996). Top ten mistakes in web design. Retrieved from the World Wide Web September 21, 1999: http://www.useit.com/alertbox/9605.hmtl

Neilson, G., Pasternack, B. & Viscio, A. (2000). Up the (e)organization! Retrieved from the World Wide Web June 6, 2000: http://www.strategy-business.com/strategy/00106/page2.html

Pennell, R. (1996). Managing online learning. Retrieved November 14, 1999 from the World Wide Web: http://elmo.scu.edu.au/sponsored/ausWeb/ausWeb96/educn/pennell/paper.html

Polyson, S., Saltzberg, S. & Godwin-Jones, R. (1996). A practical guide to teaching with the world wide web. Syllabus, 10(2), 12–16.

Reinhardt, A. (1995). New ways to learn. Byte Magazine. Retrieved November 14, 1999 from the World Wide Web: htp:www.byte.com/art/9503/9503.htm

Rutherford, P. (1996). Annotations: the key to collaborative teaching and learning on the internet. Retrieved November 1, 1999 from the World Wide Web: http://elmo.scu.edu.au/sponsored/ausWeb/ausWeb96/educn/rutherford/paper.html

Ryan, J., Neece, J. & Meyer, V. Learning on demand drives employee education. Sun Journal, 2(3). Retrieved April 27, 2000 from the World Wide Web: http://www.sun.com/SunJournal/v2n3/IndustryTrends1.html

Salopek, J. (1998). Workstation meets playstation. Training and Development, 52(8), 26–35.

Saltzberg, S. & Polyson, S. (1996). Distributed learning on the world wide web. Retrieved November 14, 1999 from the World Wide Web: http://www.umuc.edu/iuc/cmc96/papers/poly-p.html

Sanders, E. (1998). Learning Technologies. Infoline, 9902.

Schaaf, D. (1999). Bandwidth basics. Training, 36(9), OL23–OL37.

Schaaf, D. (1997). A pipeline full of promises: distance training is ready to delivery. Training, 34(10), A3–A22.

Siemens saves $2,000 per employee per week. Lotus Development Corporation. Retrieved June 21, 2000 from the World Wide Web: http://www.lotus/com/home.nsf/welcom/learningspace

Smarter Sales Force? Retrieved from the World Wide Web October 28, 2000: http://digitalthink.com/els/client/3com.html

Smith, S., Tyler, M. & Benscoter, A. (1999). Internet supported teaching: advice from the trenches. Education at a Distance, 13(1). Retrieved June 6, 2000 from the World Wide Web: http://www.usdla.org/ED_magazine/illuminactive/JAN_1999/internet.htm

Southern California Edison uses Macromedia pathware to measure and manage employee training. Lotus Development Corporation. Retrieved June 21, 2000 from the World Wide Web: http://www.lotus.com/products/learningspace/bb59c0ac1f15f5c8852567fa00833876?OpenDocument

Staley, C. (1999). Good and Cheap: No Frills WBT. Technical Training, 10(5), 29–33.

Steelcase to save resources through the use of web-based training. (2000, May 4). Monday Morning Quarterback. Retrieved May 4, 2000 from the World Wide Web: http://www.mmqb.com/mmqbnew/mmqb.rsc?mmqb=read&story=05000452938271004752125 2

Stenerson, J. (1998). Systems analysis and design for a successful distance education program implementation. Online Journal of Distance Learning Administration, 1(2). Retrieved April 16, 2000 from the World Wide Web: http://www.westga.edu~distance/Stener12.html

Strandberg, J.E. (1999. Instant answers.com. Training, 36(5), 40–44.

Ward, S. (1998). Secret recipe for CBT. Technical Training, 9(5), 16–22.

Wells, R. (1999). Back to the (internet) classroom. Training, 36(3), 50–54.

Wiley, D., South, J., Bassett, J., Nelson, L., Seawright, L., Peterson, T. & Monson, D. (1999). Three common properties of efficient online instructional support systems. Asynchronous Learning Networks Magazine,

3(2). Retrieved April 16, 2000 from the World Wide Web: http://www.aln.org/alnweb/magazine/Vol3_issue2/wiley.htm

Williams, R. (1998). Challenges to the optimal delivery of a training program via the world wide web. Retrieved September 23, 1999 from the World Wide Web: http://www.trainingplace.com/source/wbtlimit.html

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

NOTICE

Reproduction Basis

X	This document is covered by a signed "Reproduction Release (Blanket)" form (on file within the ERIC system), encompassing all or classes of documents from its source organization and, therefore, does not require a "Specific Document" Release form.
	This document is Federally-funded, or carries its own permission to reproduce, or is otherwise in the public domain and, therefore, may be reproduced by ERIC without a signed Reproduction Release form (either "Specific Document" or "Blanket").